

6 E-4-2.

REPORT

OF

SMOKE COMMITTEE

OF THE

CITIZENS' ASSOCIATION

OF CHICAGO.

ROOM 33, MERCHANTS' BUILDING.

MAY, 1889.

CHICAGO:

GEO. E. MARSHALL & CO., STATIONERS AND PRINTERS,
144 & 146 MONROE STREET.



REPORT

OF

SMOKE COMMITTEE

OF THE

CITIZENS' ASSOCIATION

OF CHICAGO.

ROOM 33, MERCHANTS' BUILDING.

BRIDGE TO THE GREAT AMERICAN
NATIONAL LIBRARY OF MEDICINE
ON ALABAMA

~~~~~  
MAY, 1889.  
~~~~~



CHICAGO:
GEO. E. MARSHALL & Co., STATIONERS AND PRINTERS,
144 & 146 MONROE STREET.

WAA
C576r
1889
c.1

NATIONAL LIBRARY OF MEDICINE
BETHESDA 14, MD. /

Film No. 2360, no. 2

ESTABLISHED 1874.

CITIZENS' ASSOCIATION

OF CHICAGO.

ROOM 33, MERCHANTS' BUILDING.

EXECUTIVE COMMITTEE, 1889.

JOHN J. GLESSNER,
President.

E. NELSON BLAKE,
Vice-President.

FRANCIS B. PEABODY,
JAMES H. McVICKER,
EDSON KEITH,

CHRISTOPH HOTZ,
EDWIN LEE BROWN,
JOHN G. SHORTALL,

O. S. A. SPRAGUE,
WM. A. FULLER,
LOUIS WAMPOLD,

HENRY FIELD,
J. HARLEY BRADLEY,
MURRY NELSON,

J. V. FARWELL, JR.

GEO. SCHNEIDER,
Treasurer.

J. C. AMBLER,
Secretary.

To the Executive Committee of the Citizens' Association :

The undersigned, Committee on Smoke, in accordance with the request and instructions transmitted to them in January, proceeded to the investigation of the "smoke nuisance," after due deliberation as to the proper method of conducting it, in the light of past experience and of more recently acquired information. They called to their assistance a mechanical engineer of intelligence and acquirements, who has made a thorough examination of the methods employed for the prevention of smoke in stationary boilers, and has condensed and tabulated his observations, as will be seen by reference to the accompanying statements.

The observations so made extended to 333 establishments where steam is in constant use for various purposes, including 839 boilers, of which 234 places have in use devices for the prevention of smoke, and 99 have no apparatus for the purpose ; the particulars are minutely set forth in the tables prepared by the expert. From an analysis of these tables it will be seen that, although the devices in use have a very marked effect on the result, as to whether the smoke emitted from the chimneys is very black or offensive, so much so as to incline us to the opinion that a proper apparatus is almost indispensable for the complete suppression of the smoke nuisance ; yet we believe that the greatest amount of good can be accomplished by careful attention to the firing, and the use of a good quality of coal. By combining these three conditions—an efficient smoke preventing device, a fair quality of coal, and careful firing—the offense arising from the chimneys in the business and manufacturing parts of the city can be reduced to insignificance.

Good results have been obtained by mingling coke, or anthracite screenings, with soft coal ; but that is practiced to but a small extent, and its beneficial effect is commensurate, after all, with the observance of proper conditions as to use, which are a part of, and included in the general term—careful firing. We see, by examination of the tables given, that the smoke arising from some chimneys where the poorest quality of coal is used, is reported as very light, when accompanied by the observation of careful, or automatic mechanical stoking.

The practice of "crowding the furnaces" with fuel is one of the most prolific sources of offensive smoke that we have to contend with; this is made necessary, or believed to be necessary from the insufficient size of boilers, or of chimneys, to perform their work. The fires have to be urged to their utmost capacity to keep up the requisite amount of steam, and this is done at a great waste of coal, the custom being to put on as much fuel as the furnace will hold, and then rake it out from below when insufficiently, or not thoroughly, burned, to make room for a fresh supply above; the result being that the outer air gets an amount of dense smoke that annoys the public, while the proprietor of the establishment pays for a large amount of fuel of which he gets no benefit. The same result occurs from heedlessness of engineers and firemen who, from indolence or ignorance, completely fill their furnaces with coal at certain periods, and pay no further attention to their fires until the time comes to give the furnace a fresh charge of fuel; all chimneys where such practices obtain emit dense smoke more than half the time. Firing should be as intelligently done as any other work; modern requirements call for perfection in most occupations or trades; yet in many cases this important business is left to the discretion, or want of discretion, of men who seem to take no interest in the welfare of their employers, or the convenience of the public. Sometimes a mistaken idea of economy induces merchants to keep a cheap man in the boiler room, who will waste more fuel than the amount of his monthly wages. Instead of crowding the furnaces by heaping up fuel upon half burned coal, the stoking should be done a little at a time, so that the greater surface of the fire will show, at all times, either an incandescent mass, or a bright flame; the last charge of fuel should be pushed back and spread over this, and the new charge put in its place; the ashes should be carefully raked out at fixed and frequent periods; by this process the steam can be kept up at two-thirds the cost of the fuel used in the practice usually adopted—that of crowding the furnace to its utmost capacity; but to accomplish it there must be intelligence and integrity in the boiler room as well as in the other departments of the establishment.

We are of opinion that the suppression of smoke, as a nuisance, is within the power of those who own the stationary boilers, and of the men who have charge of them; the former have no moral or legal right to subject their immediate neighbors, or the public, to the damage to health and property caused by their own inattention; they should act in unison, and exert their

undisputed authority to compel their employes to do their manifest duty. We have made several attempts to get an ordinance passed inflicting a fine upon engineers and firemen, in cases where the proprietors of establishments have furnished them with a suitable device for the prevention of smoke; but it has been hitherto found impossible to pass such an ordinance, and nothing remains to be done, but to bring about a consensus of opinion, and unity of action in the premises by those interested.

If the proprietors will but insist upon the observance by their engineers of certain conditions, (which should include the constant application of the smoke preventing apparatus, where there is one, under the penalty of suspension or discharge,) and supply them with a suitable device, and the quality of coal found from observation to be appropriate to the set of the boiler, the height of the chimney, and the kind of smoke preventing apparatus adopted, the greater part of this appalling nuisance can be abated. The proprietors must, however, give to this matter the proper measure of their personal attention to insure the desired result.

The principle of smoke prevention is extremely simple; but, as it is not generally understood, it may be well to explain here the cause of smoke, and the method of its prevention. When heat is applied to bituminous coal a gas is generated which is our ordinary illuminating gas in a crude state. It burns freely when mixed with the proper quantity of air. Smoke results from the failure to burn this gas in the furnace. The failure to burn the gas in the furnace results invariably from one of two causes; either, because air has not been admitted to mix with it in proper quantities and in the proper manner—in a thin sheet, or through small perforations—or, because the fireman has so completely covered the grate bars with fresh coal, as to leave no flame or heat to ignite the gas after it has received the proper admixture of air.

Any device which admits air in proper quantities into the furnace will prevent smoke, unless its operation is defeated by bad firing; that is, by piling coal upon the grate until the flames are smothered, or until more gas is created than can be absorbed by the amount of air ordinarily admitted. It is somewhat easier and less troublesome to fire badly than to fire well, because good firing requires that a small quantity of coal shall be applied at frequent intervals; and an indolent fireman prefers to throw a large quantity on the grate, and to have a longer interval of rest. The fireman, or the friendly engineer, persuades the proprietor that any

device which he may have adopted is a failure, as this excuses the acts of the fireman.

We consider the first step in the direction of an abatement of the smoke nuisance to be the education of the proprietors of steam boilers to the fact that they have in their own hands the cure of the evil, as far as their own furnaces are concerned.

In view of the large percentage of inefficient firemen, and of their ability to defeat the action of most devices, we regard the various self-feeding furnaces as more to be relied upon for the prevention of smoke than any others, as they are automatic in their action, and the best of them seem almost invariably to produce good results. The automatic furnaces commend themselves to those who count the cost of heat and power and of smoke prevention, as they admit the use of the cheapest fuel without making smoke.

Several of the devices mentioned in the accompanying tables are excellent for the purpose required ; specimens or patterns of all are within easy visiting distance of every business establishment in the city ; the inventors are but too anxious to exhibit their apparatus ; inefficient systems should be discarded ; and a brief but thorough examination should be made of the most approved patterns, with the object of selecting the device best suited to the existing conditions, which can be readily compared with others. It certainly is not unreasonable to ask for as much attention to this important subject as would be given to the purchase of a carriage, or to the introduction of house-heating apparatus, or a kitchen range.

The City Council has formed a committee to visit and inspect the various devices so that they can report on several patterns, some one of which may be found useful in any given case : it will afford us pleasure to aid them in every way. We shall, ourselves, make such a visit for the purpose of verifying our expert's report.

These remarks and considerations apply equally to the prevention of smoke in tugs and locomotive engines ; the law with regard to the offense in their case makes the engineers subject to the penalty imposed ; but no regard is paid to it. Observations made after navigation opened, this spring, demonstrated that the greater part of the nuisance can be abated by careful attention to the firing ; trips made with our expert on board showed this conclusion ; also that soon after he had left the smoke burst forth again without abatement ; there are devices on some of these vessels which

modify its volume when in use; but they are not sufficient, and are seldom in operation. As to locomotives, there is much difference in the degree of annoyance on different roads, depending, as in all other cases, on the care taken by the firemen. Recent observations show, however, that there is an apparatus which will absolutely prevent smoke on locomotives, and probably on tugs, and we refer to the notes of our expert for an account of it.

We have entered into correspondence with the magistrates of some English cities relative to the means of suppression in vogue there; these do not differ very materially from ours; the devices do not vary in principle of construction from those in use here. The powers conferred by law on municipal authorities are, in some instances, greater than ours; they have the authority, which ours have not, to compel the alteration of flues, and the use of appliances. Their mode of procedure in case of offenses is by summons and fine, which apply to the employe as well as the proprietor of an establishment offending.

Our recommendations are: That, as the Mayor has appointed a competent officer whose sole duty it has become to thoroughly investigate the smoke question, with a view to its speedy and permanent solution, the Citizens' Association shall tender to the city authorities their co-operation in all efforts for the suppression of the nuisance; and that, as a means to the end desired, an ordinance be passed amplifying the scope of the present city law with regard to the liability of firemen and engineers of stationary engines, and enabling the officers to suppress the nuisance at sight; and, that the City Smoke Bureau be so constituted that daily observations shall be made, with the object of pointing out to delinquents how their smoking chimneys can be remedied, and of enforcing the ordinance in all respects. We would, also, suggest that in any general revision of the Building Ordinance, provision be made for scientific construction of the boiler rooms and smoke stacks of factories and large mercantile buildings, with an especial view to smoke prevention.

Respectfully submitted,

BRYAN LATHROP,
JOHN H. LONG,
AUGUSTUS NEWELL,
FRED. BAUMANN,
W. J. CHALMERS,

Committee.

CHICAGO, May 20, 1889.

NOTES BY THE EXPERT EXAMINER.

A fireman who understands his business, and has a good grade of coal, can prevent a great amount of smoke if the details of his steam plant are proper; in many cases the boiler capacity is entirely inadequate to the demands upon it, and the fires have to be crowded to the utmost; smoke of the blackest kind is thus commonly evolved, without accomplishing the object. In numerous other cases the chimney capacity is entirely too small for the number of boilers attached to it; sometimes two, three, or even four boilers are dependent upon a small chimney, projecting but a few feet above the roof of the building, and often surrounded by others much higher; the draft is, in such cases, impeded, and much unnecessary smoke the consequence; a "smoke burner" of the proper pattern will assist materially in increasing the draft. The majority of the smoke preventing devices are of but little benefit, and in some cases have been of positive injury to the boilers; and even where the better style are in use, carelessness in firing, the use of an inferior grade of coal, or the sudden or habitual "crowding" of the fires, one or all together, cause much smoke at times, or at all times; of course, an apparatus will not prevent smoke, if not applied, or improperly handled. One of the first conditions for success is "don't crowd the boilers"—to use the common expression.

In some establishments in the business district the engineer has to do duty as stoker,—do his own firing; he has also charge of the elevator, and the steam-heating, and of other business; if anything occurs in any part of the building he is sent for to "fix things;" leaving his post to go to the top story, perhaps, without knowing when he shall return, he crowds his furnace full of coal, with the result of sending a dense volume of smoke out of the chimney.

These observations show that there are many instances where good apparatus does not prevent smoke, while the same device works perfectly in other cases. The causes are very evident: inadequate chimney capacity, inferior coal, imperfect and faulty setting of the boiler, or careless management of fires; here again

there is evidence that unless all details are properly arranged, and the fires carefully attended to, —in short, unless there is careful and judicious management of the whole plant, smoke will be apparent. There were expressions, in some cases, of ill-feeling with regard to the prosecutions by the city authorities, but, on the other hand, the infliction of a fine has often, confessedly, done good.

Every tug, and nearly every locomotive engine observed, was belching forth great volumes of intensely black smoke; the exceptions were on the Illinois Central suburban trains: on inquiry it was found that this Company uses bituminous coal; but the nuisance was, in their case, much less than on other locomotives, owing to careful firing. A number of tugs have steam jets in their smoke-stacks, which helps to some extent: that careful firing is the best remedy was demonstrated on the trips made, the same tugs were very offensive before and after the trips. The difficulties to be overcome on tugs and locomotives are greater than in the case of stationary boilers.

May 17. Trip on engine No. 93, Wisconsin Central Railway, —accompanied by the inventor of the device attached thereto, W. C. Thayer.

The trip from Chicago to Harlem and return was made without any visible smoke issuing from the stack of the engine, except once, when upon the suggestion of your examiner, the valves leading to the consumer were closed, whereupon dense volumes of black smoke instantly issued from the stack, to be just as quickly dispelled by again opening the steam valves. Observations were made on the following day, and another trip was made as a passenger, unknown to anybody, to see if the device would show equally good results, and it was found to work just as perfectly, as when the writer rode on the engine. There seems to be no further excuse for so much black smoke from locomotive engines in the city of Chicago, while there is such a simple, inexpensive and efficient device within the reach of all, and it would seem that the adoption of this cannot be urged any too strongly, especially as a considerable saving of fuel is said to be effected by its use. The same device is suited to tug furnaces.

RECAPITULATION OF SMOKE OBSERVATIONS, 1889.

NAME OF DEVICE.	NUMBER BOILERS OBSERVED.	MODE OF FIRING.		NUMBER MAKING SMOKE.			LITTLE OR NONE.
		GOOD.	INDIFF. OR BAD.	BLACK.	MEDIUM.	LITTLE OR NONE.	
McGINNIS.....	89	76	13	4	10	75	
STEAM JETS.....	78	42	31	23	20	30	
MURPHY FURNACE.....	70	70	0	0	0	70	
HUTCHINSON.....	55	32	23	26	14	15	
ARCHES OVER BRIDGE WALL.....	54	31	23	15	16	23	
BUTMAN.....	34	30	4	2	10	22	
SMITH.....	34	22	12	10	2	22	
BOWE.....	40	36	4	4	5	31	
MURPHY JETS.....	13	11	2	2	5	6	
ORVIS.....	14	12	2	5	6	3	
ROONEY FURNACE.....	12	10	2	2	0	10	
A. RITTER.....	12	12	0	0	0	12	
KELLEY.....	11	5	6	1	4	6	
RITCHIE.....	14	12	2	0	8	6	
OLSON.....	13	12	1	1	0	12	
FARR.....	24	20	4	0	0	24	
MCLAUGHLIN.....	8	6	2	2	2	4	
RAFFERTY.....	7	3	4	4	1	2	
THAYER.....	4	4	0	0	0	4	
MISCELLANEOUS and NAMELESS de- vices; for particulars see daily reports of observations.....	93						
No DEVICE USED.....	165	53	112	107	27	31	

RECAPITULATION OF SMOKE OBSERVATIONS WHERE NO SMOKE PREVENTIVE

DEVICE IS USED.

Number of places visited,	- - - - -	- - - - -	- - - - -	- - - - -	98
" where firing is bad, (64 per cent),	- - - - -	- - - - -	- - - - -	- - - - -	63
" " " good, (35 per cent),	- - - - -	- - - - -	- - - - -	- - - - -	35
" making black smoke,	- - - - -	- - - - -	- - - - -	- - - - -	54
" " light or very light smoke,	- - - - -	- - - - -	- - - - -	- - - - -	29
" " medium smoke,	- - - - -	- - - - -	- - - - -	- - - - -	15

WITHOUT ANY DEVICE.

Out of 63 cases of improper firing, 54 made black smoke, or 85 per cent.
 " 35 " good firing, 29 made very little smoke, or 83 per cent.
 " 63 " bad firing, only 2 are shown making light smoke.

SMOKE OBSERVATIONS, 1889.

DATE.	NAME.	BOILERS, HORSE POWER.	DEVICE IN USE.	MODE OF FIRING.	COAL USED.	CONDITION OF SMOKE.	THERMOMETER.	BAROMETER.	REMARKS.
Feb. 19	Swannel Mfg. Co. N. S.	1 Babcock & Wilcox, 75	none.	indiff.	III. coal.	black.	0	30	March 20. Very black.
"	Gormully & Jeffery.	1 tubular 75	Crucox & Veiter.	careful.	Ind. block.	light.	4	30	
"	C. A. Smith & Co.	1 tubular 65	none.	careful.	III. coal & shavings.	light.	6	30	
"	Brunswick B. & Collender.	4 tubular 250	brick arches.	careful.	III. coal.	light.	7	30	
"	Shuffeldt Distillery.	8 tubular 300	none.	crowded & careless.	III. coal.	very black.	9	30	
"	A. Richter.	2 tubular 50	Smith.	indiff.	soft coal & shavings.	black.	8	30	Consumer not in use.
"	Cribben, Sexton & Co.	1 tubular 100	Hutchinson.	heavy and indiff.	soft coal.	medium.	10	30	Sometimes very black smoke.
"	C. F. Elmes. W. S.	1 tubular 50	brick arches.	careful.	III. coal.	none, or very light.	10	30	Gave drawing of device.
"	Gradle & Strotz. S. S.	1 tubular 40	Buschick.	indiff.	Streator.	medium and black.	10	30	
"	Storm & Hill.	2 tubular 75	McGinnis.	careful.	Minonk.	very light.	11	30	
"	Strauss, Ullmann & Guthman.	2 tubular 100	McGinnis.	careful.	Ind. block.	very light.	10	30	Say will smoke if crowded.
"	Norton Milling Co. W. S.	2 tubular 150	Murphy furnace.	automatic.	Streator.	none, or very light.	9	30	
"	Wholesale H. Carson, Pirie & Co. S. S.	3 tubular 150	McGinnis.	careful.	Ind. block.	very light.	9	30	March 20. Black.

Feb. 19	Selz, Schwab & Co.	tubular 150	Olson.	careful.	Ill. coal.	medium and light.	8	30	Consumer not in use when visited.
20	Franklin MacVeagh & Co.	tubular 100	steam jets.	careful	Ind. block.	medium, sometimes very black.	0	30.2	
"	Retail, Marshall Fitch & Co.	tubular 40	McGinnis.	careful.	Pittsburgh.	very light.	2	30.2	March 30. Black
"	First National Bank.	tubular 100	Fitch.	indiff.	Ind. block.	light, but at times black.	4	30.2	March 30. Black
"	S. A. Maxwell & Co.	tubular 15	steam jets, but not used	careful.	Ind. block.	black.	5	30.2	
"	Tobey Mfg. Co. S. S.	tubular 15	Olson.	careful.	Ind. block.	light.	6	30.2	
"	Fairbanks, Morse & Co.	tubular 100	Butman.	careful.	soft coal.	light.	8	30.2	
"	A. Hillman & Co.	tubular 10	Hutchinson.	light and careful.	Ind. block, screenings.	light.	10	30.2	
"	Chicago Refrigerator W. House Co. W. S.	tubular 40	steam jets.	light and careful.	Pittsburgh.	light.	12	30.2	
"	Eckhardt & Swán.	tubular 130	Smith, Acme, steam jets and brick arches.	indiff.	Ill. coal.	black.	12	30.2	
"	Tappan & Wheeler.	tubular 15	steam jets.	careful.	soft coal.	a little blk smoke.	12	30.2	
"	Salter & Bilek.	tubular 100	steam jets and arches.	indiff.	soft coal & shavings.	light.	11	30.2	
"	Chicago Hardware Mfg. Co. N. S.	tubular 30	Hutchinson.	careful.	Ill. coal.	light.	10	30.2	When crowling, much smoke.
"	B. V. Page.	tubular 100	Murphy furnace.	automatic.	soft coal.	very light.	10	30.2	
21	Ph. Rinn. N. S.	tubular 100	none.	crowded.	soft coal & shavings.	much black smoke.	10	30	
"	M. Schultz. W. S.	tubular 50	none.	indiff.	soft coal & shavings.	black.	12	30	

SMOKE OBSERVATIONS, 1889.—Continued.

DATE.	NAME.	BOILERS. HORSE POWER.	DEVICE IN USE.	MODE OF FIRING.	COAL USED.	CONDITION OF SMOKE.	THERMOMETER.	HAROMETER.	REMARKS.
21	N. W. Lead & Oil Mfg. Co.	2 tubular 100	none.	careful.	nut coal & hard coal screenings.	light.	13	30	
"	Schumacher & Betzel.	2 tubular 100	none.	careless.	shavings & much block soft coal.	medium.	15	30	
"	Dawson Bros.	2 tubular 100	drum in front.	---	Pittsburgh nut.	very light.	18	30	
"	Pitkin, Bond & Co. S. S.	2 tubular 75	Farr.	careful.	Ind. block.	none or very light.	24	30	
"	Chicago Edison Co.	4 Heine Safety 400	Jarvis furnace.	careful.	Ind. block.	light.	30	30	
"	Blake, Shaw & Page.	2 tubular 120	Farr.	careful.	Ind. block.	very light.	32	30	
"	Insurance Ex. Bldg.	2 tubular 100	Ritchie.	careful.	Ind. block.	light.	34	30	
"	Wholesale H. Marshall Field & Co. S. S.	8 tubular 400	McGinnis.	careful.	Pittsburgh.	very light.	38	30	March 20. Black.
"	Chas. F. Kellogg & Co.	2 tubular 75	Bowe.	careful.	Pittsburgh.	light.	40	30	
"	Sweet, Dempster & Co.	2 tubular 75	Fitch.	careful.	III. coal.	medium.	40	30	March 20. Black.
"	Cahn, Wampold & Co.	1 tubular 80	McGinnis.	careful.	Pittsburgh.	light.	40	30	
"	Phelps, Dodge & Palmer.	2 tubular 100	brick arches.	careful but a little crowded.	Minonk.	medium.	40	30	March 20. Black.
25	Tremont House.	2 tubular 120	Murphy jets.	indiff.	III. coal.	medium, at times very black.	40	30	March 20. Very black.

25	Sherman House.	² tubular 150	steam jets.	indiff.	Pittsburgh.	medium.	10	30	March 20.	Very black.
"	McCormick Block.	² tubular 100	McCinnis.	careful.	Ind. block.	light.	12	30		
"	Opera House Block.	⁶ tubular 240	Hutchinson.	careful, but crowded.	Ind. block.	very black	13	30	March 20.	Very black.
"	Chicago Club Bldg.	² tubular 80	McLaughlin.	indiff.	Ind. block.	light and black.	14	30		
"	Crerar, Adams & Co.	¹ tubular 40	air ducts.	careful.	Wilmington	medium.	16	30		
"	N. W. corner of Lake & Franklin Sts.	² tubular 80	none.	careful.	Wilmington	light.	18	30		
"	Chicago Arc-Light & Power Co.	⁴ tub 8 700 H. P.	Bowe. Butman.	careful.	Ind. block.	light to medium.	20	30	March 20.	Very black.
"	W. S. Vaughan & Bushnell.	¹ tubular 50	brick arches.	careful.	soft coal screenings.	light.	22	30		
"	Gaus, etc.	² tubular 100	Murphy furnace.	automatic.	soft coal screenings.	light.	20	30		
"	Plamondon Mfg. Co.	¹ tubular 50	brick larches.	careful.	Ill. coal.	light.	20	30		
"	Wacker & Birk Brewery Co.	⁴ tubular 250	none.	careful.	soft coal screenings.	ordinarily light.	20	30	At times much black smoke.	
"	N. S. Adams & Westlake.	⁵ tubular 300	none.	careful.	soft coal.	light.	20	30		
26	S. S. Metropolitan Block.	² tubular 120	McCinnis.	careful.	Ind. block.	light.	27	30	March 20.	Very black.
"	Daily News.	² tubular 120	brick arches.	ordinary.	Ill. coal.	light, but at times very black.	28	30	March 20.	Very black.
"	Major Block.	² tubular 100	Hutchinson.	careful.	Laurel Hill	black.	29	30	March 20.	Very black.
"	Taylor Building.	³ tubular 160	steam jets.	careful.	soft coal.	light.	30	30		

SMOKE OBSERVATIONS, 1889.—Continued.

DATE.	NAME.	BOILERS, HORSE POWER.	DEVICE IN USE.	MODE OF FIRING.	COAL USED.	CONDITION OF SMOKE.	THERMO- METER.	BARO- METER.	REMARKS.
26	National Life Ins. Bldg.	5 1 tub. 120 2 "	Olson, McGinnis.	crowded.	Ind. block.	light, but at times black	31	30	March 20. Black.
"	Gore's Hotel.	tubular 150	Murphy jets.	careful.	Ind. block.	light.	32	30	
"	Traders Building.	tubular 160	Rafferty.	indiff.	soft coal.	black.	32	20	
"	Phenix Ins. Bldg.	tubular 250	brick arches.	careful.	Ill. coal.	medium.	33	30	
"	W. Union Tel. Bldg.	tubular 100	Hutchinson.	careful.	Ind. block.	medium.	34	30	
"	Siegel, Cooper & Co.	tubular 2	Olson.	careful.	Ind. block.	light.	34	30	
"	Exchange Building.	tubular 120	steam jets.	indiff.	Ind. block.	black.	34	30	
"	Rialto Building.	tubular 300	Farr.	careful.	Ind. block.	light.	34	30	
"	Board of Trade Bldg.	tubular 400	Butman.	careful.	Ind. block.	light.	34	30	
27	N. S. Vogler & Gendtner.	Babcock & Wilcox, 100	Hutchinson.	indiff.	Ind. block & shavings	black.	33	30	
"	McFwen Mfg. Co.	tubular 120	Smith.	crowded.	soft coal & shavings.	light.	33	30	At times they make very black smoke.
"	Theo. A. Kochs.	tubular 100	Smith.	careful.	Ill. coal.	light.	34	30	When consumer was turned off, very black smoke.
"	Spichman Bros.	tubular 80	none.	careless.	soft coal. very black	very black	34	30	Much very black smoke produced at all times.

27	Union Wire Mattress Co.	1 tub. 1 120	Hutchinson, none.	indiff.	Ind. block & shavings	medium.	34	30	
"	Chicago Rawhide Mfg. Co.	1 tubular 30	fan for forced draught.	careful.	soft coal screenings.	light.	34	30	Have seen some black smoke occasionally.
"	Chicago Drop Forge Co.	2 tubular 100	H. T. Russell's patent petroleum burner.	-----	crude petroleum.	none or very light.	34	30	
"	Streeter Iron Works.	1 tubular 50	Kelley.	crowded.	Pittsburgh nut.	medium.	34	30	
"	Ashland Block.	2 tubular 120	Murphy jets.	careful.	Ind. block.	medium.	35	30	March 20. Very black. At times much black smoke.
"	Portland Block.	2 tubular 80	Ritchie.	careful.	Ind. block.	light.	36	30	March 20. Very black.
"	Ill. Bank Building.	2 tubular 100	none.	careful.	Ind. block.	medium.	35	30	
"	Howland Block.	1 tubular 80	steam jets.	indiff.	Ind. block.	medium.	35	30	
"	Adams Ex. Bldg.	4 tubular 200	Kelley.	indiff.	Ind. block.	medium.	34	30	
"	Temple Court Bldg.	2 tubular 100	Rafferty.	careful.	all kinds.	light.	34	30	March 20. Black.
"	James H. Walker & Co.	1 tubular 100	steam jets.	indiff.	Ind. block.	light.	33	30	
28	Superior Nickel Works	1 tubular 60	McGinnis.	careful.	Ill. coal.	some smoke.	28	30	Claimed that arch was out of order, other- wise no smoke made.
"	H. J. Berry.	1 tubular 50	none.	careless.	Ill. coal.	much black smoke.	28	30	
"	R. W. McCready.	1 tubular 50	none.	careful.	nut coal.	light.	29	30	
"	John Mohr & Son.	1 tubular 50	Murphy furnace.	automatic.	Ill. nut.	light.	30	30	
"	Empire Steam Cooked Feed Co.	1 tubular 75	brick arches.	careful.	Ind. block.	very light.	31	30	The arrangement here was the engineer's own invention. Would not give partic- ulars until patented.

SMOKE OBSERVATIONS, 1889.---Continued.

DATE.	NAME.	BOILERS. HORSE POWER.	DEVICE IN USE.	MODE OF FIRING.	COAL USED.	CONDITION OF SMOKE.	THERMOMETER.	BAROMETER.	REMARKS.
28	Davidson & Sons.	2 tubular 150	steam jets.	indiff.	Ind. block.	at times light.	32	30	Much black smoke at times.
"	Tudor Buggy Co.	1 tubular 50	none.	careful.	soft coal.	medium.	33	30	
"	Galena Elevator.	2 tubular 150	McGinnis.	careful.	Ind. block.	light.	34	30	
"	Cable Car Eng. House La Salle & Ill. Sts.	2 tub. 200 1 " 100	H. P. Rooney furnace. none.	crowded.	soft coal screenings, hard coal screenings & lump coal.	much black smoke.	35	30	
"	Borden Block.	2 tubular 100	none.	careful.	soft coal screenings, hard coal screenings & lump coal.	light.	36	30	
"	N. S. Kirk's Soap Factory.	16 tub. 1200 H. P.	Murphy furnace.	automatic.	soft coal screenings.	very light.	35	30	
"	S. S. Sherman Bros. & Co.	1 tubular 50	Hutchinson.	careful.	soft coal.	light.	34	30	
March.									
1									
2	Bradley Mfg. Co.	1 tubular 200	McGinnis.	crowded and indiff.	Ill. coal.	medium.	34	30	
"	J. C. Meyer.	1 tubular 50	Hutchinson.	crowded.	nut coal.	black smoke.	34	30	Consumer not in use.

The condition of the weather to-day being rather peculiar—murky, with low barometer—the day was spent in taking observations on the ground already gone over; in order to note the effect of the weather upon the smoke production. It gives me pleasure to be able to report that taking it altogether, there was much less smoke produced, than at any time since my observations were begun. A few places were vomiting forth the usual amount of smoke, as for instance the Sherman, the Chicago Opera house block, and some of the factories on the North side, prominent among which were those at Market and Huron streets; and at 36 Erie street, the last of which I have repeatedly observed, and found to emit volumes of smoke at times; they have a consumer, but it is evidently not in use. Other buildings giving forth less smoke than usual, it might possibly be due to the fact, that the day being rather mild less steam was used for heating purposes than usual, and consequently firing was proportionately lighter, and in places visited this was substantiated in every case.

2	Chicago White Lead & Oil Works.	³ tubular 200	brick arches.	careful.	Ind. block.	light.	34	30
"	New England Mills.	² tubular 120	none.	indiff.	soft coal.	much bl'ck smoke.	34	30
"	Fraser & Chalmers.	⁴ tubular 200	Hutchinson.	careful.	soft coal.	light.	34	30
"	Brewer & Hoffman Brewery Co.	² tubular 120	none.	careful.	Ind. block.	light.	34	30
"	S. S. Merchants' Building.	² tubular 100	McGinnis.	careful.	soft coal screenings.	very light.	34	30
"	Heath & Milligan Co.	³ tubular 150	McGinnis.	crowded and indiff.	soft coal.	much bl'ck smoke.	34	30
"	88 and 90 La Salle St.	² tubular 80	steam jets.	indiff.	Ind. block.	black smoke.	34	30
"	S. D. Kimbark.	¹ tubular 50	Murley.	careful.	Ill. coal.	very light.	34	30
"	McNeil, Higgins & Co.	¹ tubular 50	Orvis.	careful.	Ill. coal.	light.	34	30
"	Central Music Hall.	² tubular 100	none.	-----	hard coal.	none.	34	30
"	Fedore Block.	² tubular 80	Hutchinson.	careful.	Laurel Hill	medium.	34	30
"	Equitable Building.	¹ tubular 50	Orvis.	indiff.	Ind. block.	medium.	34	30
4	95 & 97 Washington St.	¹ tubular 50	steam jets.	indiff.	Ind. block.	medium.	35	29.5
"	Hawley Block.	¹ tubular 50	Butman.	indiff.	Ind. block.	medium.	35	29.5
"	Willoughby, Hill & Co.	² tubular 120	Hall.	careful.	Ind. block.	very light.	35	29.7
"	Montauk Block.	² tubular 120	Ritchie.	careful.	hazel.	ordinarily light.	35	29.7

Would apparently make no smoke regard-
less of firing.

Have never seen any black smoke from
this place.
Have seen some very black smoke issue
from here.

SMOKE OBSERVATIONS, 1889.—Continued.

DATE.	NAME.	BOILERS. HORSE POWER.	DEVICE IN USE.	MODE OF FIRING.	COAL USED.	CONDITION OF SMOKE.	TIHERMO METER.	BARO- METER.	REMARKS.
4	S. S.								
	Bay State Building.	2 tubular 100	McGinnis.	careful.	Ind. block.	light.	35	29.7	
"	Brevoort House.	2 tubular 80	Smith.	careful.	soft coal screenings.	black.	35	29.7	
"	Franklin Building.	2 tubular 120	McGinnis.	light and careful.	soft coal screenings.	light.	35	29.7	
"	Loeb Building.	1 tubular 50	Murphy jets.	careful.	Ill. coal.	medium.	35	27.7	
"	Rubel Bros. Building.	2 tubular 100	McGinnis.	careful.	Ind. block.	light.	35	29.7	
"	Girard Building.	2 tubular 120	Farr.	careful.	soft coal screenings.	light.	35	29.7	
"	Commerce Building.	6 tubular 300	Ritchie.	careful.	soft coal screenings.	medium.	35	29.7	
"	Royal Ins. Building.	4 tubular 200	Batman.	careful.	Ind. block.	light.	35	29.7	
"	The Fair.	2 tubular 120	Bowe.	careful.	Ind. block.	very light.	35	29.7	March 29. Very black.
5	W. S.								
	Burton Block.	2 tubular 120	brick arches.	indiff.	Ind. block.	medium.	38	29.5	
"	Fortune Bros. Brg. Co.	4 tubular 200	Murphy furnace.	automatic.	Ill. coal.	very light.	38	29.5	
"	Knisely Building.	3 tubular 150	brick arches.	careful.	Ill. coal.	light.	38	29.5	
"	Munson's Building.	1 tubular 50	McGinnis.	careful.	Ind. block.	light.	38	29.5	

5	S. E. corner of Canal & Washington.	1 tubular 50	none.	indif.	nut coal & shavings.	medium.	38	29.5
"	Gates Building.	1 tubular (8)	drum in front.	indif.	Ill. coal.	light.	38	27.5
"	Jackson Building.	2 tubular 100	Hutchinson.	crowded.	Ill. coal.	black.	38	29.5
"	St. Paul Elevator.	4 tubular 200	McGinnis.	careful.	Ind. block.	very light.	38	29.5
"	S. S. Calumet Building.	2 tubular 100	Bowe.	careful.	Ind. block.	very light.	38	29.5
"	S. S. Home Ins. Building.	4 tubular 200	A. Ritter.	-----	Ind. block.	very light.	38	29.7
"	Rand, McNally & Co.	2 tubular 100	Smith & Bowe.	careful.	Ohio coal.	light.	38	29.7
"	Mandel Bros.	4 tubular 200	Farr.	careful.	Pittsburgh.	very light.	38	29.7
"	D. E. Fisk & Co.	3 tubular 120	none.	careful.	Ind. block.	light.	38	29.7
"	Lenox Building.	2 tubular 100	brick arches and steam jets.	careful.	Ind. block.	light	38	29.7
6	L. J. McCormick Bldg.	2 tubular 100	McGinnis.	careful.	Ind. block.	light.	48	29.20
"	Hibbard, Spencer & Co	2 tubular 100	arches.	crowded.	Ind. block.	medium.	48	29.20
"	G. W. Ludlow & Co.	2 tubular 100	steam jets.	careful.	Ill. coal.	medium.	48	29.20
"	68 & 70 Wabash Ave., C. H. Blakeley.	1 tubular (4)	J. D. Lee's patent.	crowded.	Ill. coal.	none.	48	29.20
"	Lord, Owen & Co.	1 tubular 40	McGinnis.	careful.	Ind. block.	light.	48	29.20
"	A. F. Risser.	2 tubular 75	none.	light and careful.	Ill. coal.	medium.	48	29.20

Will smoke at times.

March 20. Very black.
Sometimes very black.

SMOKE OBSERVATIONS, 1889.—Continued.

DATE.	NAME.	BOILERS, HORSE POWER.	DEVICE IN USE.	MODE OF FIRING.	COAL USED.	CONDITION OF SMOKE.	THERMO- METER.	BARO- METER.	REMARKS.
6	French, Potter & Wilson.	3 tubular 120	Backus.	careful.	Ohio.	medium.	48	29.20	March 20. Black.
"	Chicago Carpet Co.	2 tubular 100	Stanton.	careful.	Laurel Hill	medium.	48	29.20	
"	Rookery Building.	8 tubular 400	A. Ritter.	—	Ind. block.	very light.	48	29.20	
"	Foreman Building.	2 tubular 120	Cutbickson.	careful.	Ind. block.	medium.	48	29.20	
"	Jos. Beifield & Co.	2 tubular 100	Bowe.	careful.	Ind. block.	very light.	48	29.20	March 20. Very black.
"	Catunet Paper Co.	2 tubular 100	none.	ordinary.	Ill. coal.	black.	48	29.20	
"	Grand Pacific Hotel.	5 tubular 250	Orvis.	careful.	Ill. coal.	medium.	48	29.20	March 20. Very black.
7	S. S. Edson Keith & Co.	3 tubular 150	Smith.	careful.	Ind. block.	light.	35	29.5	
"	Argyle Building.	2 tubular 100	steam jets.	light and careful.	soft coal screenings.	light.	35	29.5	
"	Pullman Building.	4 tubular 200	Latham.	careful.	Laurel Hill	medium.	85	29.5	March 20. Very black.
"	Lakeside Building.	2 tubular 100	McGinnis.	light and careful.	Wilson coal	very light.	35	29.5	
"	Monroe & Fifth Ave., Owings Building.	1 tubular 60	none.	careful.	Ind. block.	light.	35	39.5	Black at times. March 20. Very black.
"	Telephone Building.	2 tubular 120	none.	careful.	Pittsb. nut & h'rd coal screenings.	light.	35	29.5	March 20. Very black.

7	Barnhart Bros. & Spindler.	1 tubular 50	Smith.	indiff.	Ill. coal.	medium.	35	29.5	
"	Strauss, Goodman, Yondorf & Co.	2 tubular 100	McGinnis.	crowded.	Ind. block.	light.	35	29.5	March 20. Very black.
"	Henry W. King & Co.	2 tubular 120	Smith.	light and careful.	Ill. coal.	light.	35	29.5	
"	J. V. Farwell & Co.	8 tubular 600	4 Schroll furnaces 4 steam jets.	careful.	Pittsburgh.	very light.	35	29.5	
"	C. M. Henderson & Co.	2 tubular 100	steam jets.	indiff.	Ill. coal.	medium.	35	29.5	March 20. Black.
"	Wholesale H. Wilson Bros.	2 tubular 120	arches.	careful.	Ind. block.	light.	35	29.5	
8	85 and 87 Fifth Ave., White Building.	1 tubular 40	none.	careful.	Ind. block.	light.	35	29.2	
"	Monroe St., 237 & 239.	2 tubular 100	none.	indiff.	Pittsburgh.	black.	35	29.2	
"	Wheeler Building.	2 tubular 120	Farr.	careful.	Ind. block.	none or very light.	38	29.2	
"	Br. Jonathan Bldg.	2 tubular 120	Orvis.	careful.	Ind. block.	light.	38	29.2	
"	Schmiedewend & Lee Co.	1 tubular 60	none.	careful.	soft and hard coal screenings.	light.	38	29.2	
"	Geo. F. Kimball.	3 tubular 150	Smith.	light.	Ind. block.	black.	38	29.2	
"	S. S. A. C. McClurg & Co.	2 tubular 100	Farr.	careful.	Ind. block.	light.	38	29.2	
9	W. S. Dake Bakery.	2 tubular 120	Hutchinson.	careful.	Ind. block.	light.	30	30	
"	Rice & Whitacre.	2 tubular 120	McGinnis.	careless.	Wilmington	light to medium.	30	30	
"	Wm. J. Moxley.	1 tubular 50	Thayer.	careful.	Wilmington	light to medium.	30	30	

SMOKE OBSERVATIONS, 1889.—Continued.

DATE.	NAME.	BOILERS, HORSE POWER.	DEVICE IN USE.	MODE OF FIRING.	COAL USED.	CONDITION OF SMOKE.	THERMO- METER.	HARO- METER.	REMARKS.
9	Whitman & Barnes Mfg. Co.	1 tubular 40	none.	careful.	Ind. block.	light.	30	30	
"	Collins & Burgie.	1 tubular 75	' steam jets.	indiff.	III. coal.	black.	40	30	
"	Wright & Lawther Mfg. Co.	3 tubular 300	McGinnis.	careful.	Wilm'gton	light.	30	30	
"	Young & Farrell.	2 Babcock & Wilcox 150	none.	careful.	Streator.	light.	30	30	
"	F. H. Hill Co.	2 tubular 120	Douglas.	careful.	Wilm'gton	light.	30	30	Device not in use at the time.
"	Geo. H. Taylor & Co.	2 tubular 100	Smith.	careful.	Ind. block & coke.	light.	30	30	
"	Appleby Building.	2 tubular 150	Murphy jets.	careful.	III. coal.	medium.	30	30	
11	Fuller & Fuller.	2 tubular 100	none.	light and careful.	Laurel Hill and Ind. block.	light.	34	30.2	
"	M. D. Wells & Co.	2 tubular 100	steam jets, hardly ever used.	light and careful.	Ind. block.	light.	34	30.2	
"	Tabernacle Building.	4 tubular 300	McGillicuddy.	careful.	Pittsburgh lump.	light.	34	30.2	March 30. Much smoke.
"	Kahn, Schoenbrunn & Co.	2 tubular 100	McGinnis.	careful.	Ind. block.	light.	34	30.2	
"	Market & Jackson, McCormick Building.	2 tubular 150	McGinnis.	careful.	Ind. block.	light.	34	30.2	
"	Kuh, Nathan & Fischer.	3 tubular 150	Thayer.	careful.	Ind. block.	light.	34	30.2	

11	Commercial Building.	tubular 100 2	Bowe.	indiff.	Ind. block.	medium to black.	34	30.2	
"	S. S. American Exp. Bldg.	tubular 4 30	steam jets.	crowded and indiff.	Ill. coal.	black, and lots of it.	34	30.2	March 20. Very black.
"	Ayer Building.	tubular 100 2	Ritchie.	indiff.	Ind. block.	light to medium.	34	30.2	March 20. Very black.
"	Mackin Building.	tubular 100 2	Hutchinson.	careful.	Ind. block.	medium.	34	30.2	
"	C. J. Fry Building.	tubular 80 2	none.	crowded.	Ind. block.	black.	34	30.2	
"	Pitkin & Brooks.	tubular 80 2	steam jets.	light and careful.	Pittsburgh.	light.	34	30.2	March 20. Very black.
"	Doggett Building.	tubular 100 2	arches.	light.	Ill. coal.	light.	34	30.2	
"	S. G. Wilkins.	tubular 1 40	arches.	light.	Ill. coal.	light.	34	30.2	
12	J. A. Tolman & Co.	tubular 100 2	McGinnis.	careful.	Wilm'gton	light.	42	29.8	
"	A. R. Bremer & Co.	tubular 100 2	arches.	indiff.	Ill. coal.	medium.	42	29.8	
"	Sprague, Warner & Co.	tubular 100 2	steam jets.	indiff.	Kentucky lump.	very black.	42	29.8	March 20. Very black, and lots of it.
"	C. H. Slack.	tubular 100 2	none.	indiff.	Ind. block.	very black.	42	29.8	March 20. Very black, and lots of it.
"	Mentor Block.	tubular 1 50	steam jets.	careful.	Ind. block.	black.	42	29.8	March 20. Black, Clann jets good, if properly used.
"	Studebaker Building.	4 Babcock & Wilcox 400	Murphy furnace.	automatic.	Illinois screenings.	very light.	42	29.8	
"	Jones School.	tubular 100 2	steam jets.	light.	Ill. coal.	black.	42	29.8	March 20. Very black.
"	Regan Printing House	tubular 100 2	steam jets.	indiff.	soft coal.	black.	42	29.8	

SMOKE OBSERVATIONS, 1889.—Continued.

DATE.	NAME.	BOILERS, HORSE POWER.	DEVICE IN USE.	MODE OF FIRING.	COAL USED.	CONDITION OF SMOKE.	THERMO-METER.	BARO-METER.	REMARKS.
12	Brown, Pettibone & Co.	1 tubular 60	Olson.	light and careful.	soft coal screenings.	very light.	42	29.8	
"	Rawson Building.	2 tubular 120	Bowe.	careful.	Kentucky lump.	light.	42	29.8	
"	W. F. McLaughlin & Co.	2 tubular 120	Smith.	indiff.	Oakhill.	black.	42	29.8	
"	Webber Boot & Shoe Factory.	1 tubular 30	none.	careful.	Ill. coal.	very black.	42	29.8	
"	Price Bkg. Powder Co.	2 tubular 120	Hutchinson.	light and careful.	Ind. block.	light.	42	29.8	
"	H. H. Shufeldt & Co. Warehouse.	1 tubular 50	steam jets.	indiff.	Ill. coal.	medium.	42	29.8	
"	Lill & Bullen's Malt House.	2 tubular 100	Steg.	indiff.	hard and soft coal screenings.	ordinary light.	42	29.8	At times very black smoke is produced here.
13	Western Toy Co.	3 tubular 200	none.	indiff.	shavings & Wilim iron and black.	medium	38	30	
"	Cable Eng. House, Elm St.	8 tubular 800	Rooney furnace.	automatic.	soft coal & screenings.	very light.	38	40	
"	Aug. Beck Tobacco Factory.	2 tubular 100	steam jets.	light and careful.	Hocking Valley.	light.	38	30	
"	Chicago Marble Co.	2 tubular 120	none.	indiff.	cheap and poor Ill. coal.	very black.	38	30	
"	Samuel Bliss.	1 locomotive (40) 1 tubular 50	Smith.	careful.	Ind. block.	light.	38	30	
"	Spaulding & Merrick.	2 tubular 120	Hutchinson.	careful.	refuse and soft coal screenings.	light.	38	30	

13	S. S.	Ft. Dearborn Block.	1 tubular 50	none.	indiff.	Pittsburgh.	medium.	38	30
"	"	Thompson & Taylor.	2 tubular 100	McGinnis.	careful.	Pittsburgh.	light.	38	30
"	"	W. M. Hoyt.	1 tubular 50	Kelley.	careful.	Wilm'gton	light.	38	30
"	"	Central Elevator.	3 tubular 300	McGinnis.	careful.	Ill. coal.	light.	38	30
"	"	Ely Block.	1 tubular 60	none.	indiff.	Ill. coal.	medium.	38	30
"	"	John C. Neemes & Co.	1 tubular 60	Hutchinson.	careful.	soft and hard coal screenings.	light.	38	30
"	"	Royal Hotel.	1 tubular 50	none.	indiff.	Ill. coal.	very black.	38	30
14	N. S.	Franklin School.	1 tubular 75	none.	indiff.	Ind. block.	very black.	50	29.8
"	"	Bruschke Furniture Co	2 tubular 120	Hutchinson.	indiff.	shavings & soft coal.	black.	50	29.5
"	"	107 & 109 Elm Street.	1 tubular 30	none.	careful.	nut coal.	light.	50	29.5
"	"	Oak Street School.	1 tubular 75	none.	careful.	Ind. block.	light.	50	29.5
"	"	Chicago Brewing Co.	2 tubular 150	none.	careful.	Ind. block.	light.	50	29.5
"	"	100 & 108 Wood Street, Ang. Huske.	1 tubular 100	none.	indiff.	shavings & nut coal.	light.	50	29.5
"	"	Zaengerle Mfg. Co.	2 tubular 100	none.	careless.	shavings & nut coal.	very black.	50	29.5
"	"	Sibley Block.	2 tubular 100	steam jets.	careful.	Ind. block.	light.	50	29.5
"	"	Kelley, Maus & Co.	2 tubular 130	McGinnis.	careful.	Ind. block.	light.	50	29.5

SMOKE OBSERVATIONS, 1889. — *Continued.*

DATE.	NAME.	BOILERS. HORSE POWER.	DEVICE IN USE.	MODE OF FIRING.	COAL USED.	CONDITION OF SMOKE.	THERMO- METER.	BARO- METER.	REMARKS.
14	C. & N. W. Office Bldg.	3 tubular 150	arches and Ashcroft doors.	careful.	Ind. block.	light.	50	29.5	March 20. Very black.
"	A. L. Singer & Co.	2 tubular 150	Butman.	careful.	Ind. block.	light.	50	29.5	
"	Kohn Bros.	2 tubular 150	Creeger.	light and careful.	Pittsburgh.	light.	50	29.5	
"	Willoughby Building.	2 tubular 100	none.	light and careful.	Ind. block.	light.	50	29.5	March 20. Very black.
"	J. W. Ostrander.	2 tubular 100	steam jets.	light and careful.	Ind. block.	medium.	50	29.5	
15	W. S. Chicago Sugar Works.	32 Babcock & Wilcox 500	Murphy furnace on part.	automatic.	Ill. coal screenings.	black.	52	29.3	The black smoke was caused by the use of a few boilers that had not yet been fitted with the Murphy furnaces.
"	Wilson Street, Crane Bros. Mfg. Co.	2 tubular 100	none.	indiff.	soft coal screenings.	black.	52	29.3	
"	City Elevator.	1 tubular 120	none.	careful.	Ind. block.	light.	52	29.3	
"	S. S. Union Bag & Paper Co.	2 tubular 120	McLaughlin.	careful.	Ind. block.	light.	52	29.3	Spoke very highly of consumer.
"	Donohue & Henncherry.	2 tubular 100	Latham.	careful.	soft coal screenings.	light.	52	29.3	
"	A. N. Kellogg.	2 tubular 100	Olson.	careful.	Ind. block.	light.	52	29.3	
"	Twenty-second Street, Cable Eng. House.	4 Babcock & Wilcox	Rooncy. Orvis.	automatic. careful.	Ind. slack. Ind. slack.	very light. black.	52 52	29.3	
"	Bemis & McAvoy Brewing Co.	4 Babcock & Wilcox 400	none.	indiff.	soft and hard coal screenings.	light, and black. at times black.	52	29.3	

15	Cook Brewing Co.	2 tubular 120	none.	careless.	manure & soft coal, nut.	medium.	52	29.3	
"	Seipp Brewing Co.	5 tubular 100	device of their own.	indiff.	Pittsburgh lump.	black.	52	29.3	Claimed that their device was out of order.
"	Keeley Brewing Co.	4 tubular 300	none.	indiff.	Ind. block.	black.	58	29.3	
16	H. Disston & Sons.	7 tubular 150	none.	crowded.	Pittsburgh.	medium to black.	58	29.3	
"	Old House, Marshall Field & Co.	6 tubular 400	McGinnis.	light.	Pittsburgh.	very light.	58	29.3	
"	M. E. Page & Co.	3 tubular 150	Hutchinson.	indiff.	Ind. block.	medium.	58	29.3	March 20. Very black.
"	Partridge's.	2 tubular 80	none.	indiff.	Pittsburgh.	black.	58	29.3	March 20. Very black.
"	McVicker's Theatre.	Heine Safety 200	perforated bridge wall	careful, but crowded.	soft coal & coke.	medium.	58	29.3	
"	Palmer House.	6 tubular 500	Murphy furnace.	automatic.	soft coal screenings.	generally light.	58	29.3	March 20. Very black. At times every day very black smoke in large volumes may be seen from this chimney.
"	Wanamaker & Brown	2 tubular 80	Smith.	light and careful.	Ind. block.	light.	58	29.3	March 20. Black.
"	Meth. Book Concern.	1 tubular 75	steam jets.	careful.	Ind. block.	light.	58	29.3	
"	John Kranz.	1 tubular 50	steam jets.	indiff.	Ind. block.	medium to black.	58	29.3	
"	Grommes & Ullrich.	1 tubular 80	steam jets.	careful.	Ind. block.	light.	34	29.3	
18	Gray, Kingman & Collins.	2 tubular 150	Smith.	light and careful.	Ind. block.	light.	34	29.5	
"	E. B. Miller & Co.	2 tubular 120	Whalen.	light and careful.	Ill. coal.	light.	34	29.5	
"	S. S. 19 & 21 Lake Street, McCormick.	2 tubular 150	Hutchinson.	careful.	Jackson Hill.	light.	34	29.5	

SMOKE OBSERVATIONS, 1889. — *Continued.*

DATE.	NAME.	BOILERS, HORSE POWER.	DEVICE IN USE.	MODE OF FIRING.	CONDITION OF SMOKE.	COAL USED.	THERMO- METER.	HARG- METER.	REMARKS.
18	Chicago Stamping Co.	tubular 100	Cregier.	light and careful.	Ind. block.	medium.	34	29.5	Consumer not in use.
"	A. F. Seeberger & Co.	tubular 50	none.	careful.	Ind. block.	light.	34	29.5	
"	M. Shields.	tubular 50	Kelley.	crowded.	Ind. block.	medium to black.	34	19.5	
"	Cameron, Amberg & Co.	tubular 120	McLaughlin.	careful.	Ind. block.	light.	34	29.5	
"	Wells & Nellegar Co.	tubular 100	Smith.	light.	Ind. block.	light.	34	29.5	
"	Marine Building.	tubular 100	Smith.	crowded.	Ind. block.	light to medium.	34	29.5	March 24. Ver black.
"	F. C. Wilson & Co.	tubular 120	brick arches.	light.	Ill. coal.	medium.	34	29.5	
"	A. H. Andrews.	tubular 80	Olson.	light.	Ill. coal.	light.	34	29.5	
"	Retail House, Carson, Pirie & Co.	tubular 200	steam jets.	careful.	Ind. block.	light.	34	29.5	
"	C. M. Hotchkiss & Co.	tubular 50	steam jets.	indiff.	Pittsburgh slack.	medium.	34	29.5	
"	P. Lorillard & Co.	tubular 50	Hutchinson.	indiff.	Ind. block.	medium.	34	29.5	
"	Skeen & Stuart.	tubular 120	steam jets.	indiff.	Laurel Hill	medium.	34	29.5	
19	Union Storage Co.	tubular 150	none.	indiff.	Pittsburgh.	black.	34	29.5	

19	Douglas & Stuart.	³ tubular 225	none.	indiff.	Oat hulls & nut coal.	light.	34	29.5	
"	Carsley & East Mfg. Co	² tubular 150	steam jets.	indiff.	nut coal & shavings.	medium.	34	29.5	
"	Goofried Brewing Co.	³ tubular 200	Smith.	crowded.	Ind. block.	black.	34	29.5	
"	L. Hutt Box Factory.	² tubular 100	Butman.	crowded.	shavings.	black.	34	29.5	
"	S. S.	¹ tubular 80	none.	careful.	Ill. coal.	light.	34	29.5	
"	N. K. Fairbank & Co.	¹⁸ tubular 1500	Bowe.	careful.	Ill. coal.	light.	34	29.5	
"	W. S.	¹ tubular 400	none.	indiff.	Ind. block.	medium.	34	29.5	
"	Schoenhofen Brg. Co.	⁴ tubular 400	none.	indiff.	Ind. block.	black.	34	29.5	
"	F. Wenter.	¹ tubular 60	none.	indiff.	shavings & nut coal.	black.	34	29.5	
"	R. G. Stevens.	¹ tubular 150	none.	indiff.	Ill. coal.	black.	34	29.5	
"	W. E. Frost Mfg. Co.	² tubular 150	none.	crowded.	shavings.	medium.	34	29.5	
30	This day was spent in taking observations on the ground gone over, and it was demonstrated that even the heretofore best behaved chimneys were making a great amount of smoke, due to carelessness in firing in most cases. About forty observations were made, with the result as marked in the "remarks" column in every case observed. There was, this day, a sudden change in the weather, from mild to cold.								
21	S. S.	² tubular 80	none.	careful.	Ind. block.	medium.	40	30.2	
"	C. B. & Q. Gen. Office.	³ tubular 300 ¹ Babcock & Wilcox 100	McGinnis.	careful.	Ind. block.	very light.	40	30.2	
"	Connschman Building.	² tubular 100	Hutchinson.	careful.	Ind. block.	medium.	40	30.2	

SMOKE OBSERVATIONS, 1889. — *Continued.*

DATE.	NAME.	BOILERS, HORSE POWER.	DEVICE IN USE.	MODE OF FIRING.	COAL USED. OF SMOKE.	CONDITION OF SMOKE.	THERMO- METER.	BARO- METER.	REMARKS.
21	N. S. N. Side Water Works.	12 boilers, 2 with Murphy furnace	1 ——— Murphy furnace.	careful.	hard coal. soft coal.	very light.	40	30.2	
"	Strom Mfg. Co.	tubular 75	none.	indiff.	Ill. coal.	very black.	40	30.2	
"	J. L. Dietz & Co.	tubular 120	Hutchinson.	crowded.	shavings & nut coal.	black.	40	30.2	
"	Linde Ice Mach. Co.	tubular 100	none.	light and careful.	nut coal.	light to medium.	40	30.2	
"	Armour Elevator.	tubular 400	Butman.	careful.	Ind. block.	very light.	40	30.2	
"	Biegler & Tindieson.	tubular 40	none.	careless.	Ill. coal.	very black.	40	30.2	
"	Pacific Elevator.	tubular 120	none.	careful.	Pittsburgh.	medium.	40	30.2	
"	Bemis & Curtis.	tubular 50	none.	indiff.	Ill. coal.	black.	40	30.2	
22	W. S. Baragwanath & Son.	tubular 50	none.	indiff.	slack.	black.	42	30.5	
"	Ideal Folding Bed Co.	tubular 50	none.	careless.	nut coal.	black.	42	30.5	
"	Chicago Malt & Grain Co.	tubular 75	none.	careful.	Pittsburgh.	medium.	42	30.5	
"	Union Hide & Leather Co.	tubular 120	none.	indiff.	nut coal.	black.	42	30.5	
"	H. Faepecke & Co.	tubular 200	none.	crowded.	shavings & nut coal.	very black.	42	30.5	

32	Kiltz N. Mangson.	² tubular 40	none.	careless.	shavings & very black nut coal.	42	30.5
"	N. Eisendrath.	¹ tubular 40	none.	indiff.	nut coal. very black.	42	30.5
"	Koenig & Gerner.	² tubular 100	none.	careful.	shavings & Ind. block. light.	42	30.5
"	Briston & Co.	¹ tubular 60	none.	careful.	shavings & Ind. block. light.	42	30.5
"	N. S. Ernst Bros. Brg. Co.	³ tubular 225	none.	careful.	Pittsburgh. medium.	42	30.5
"	Wolf Bros. & Nolan.	¹ tubular 15	none.	indiff.	shavings & slack. very black.	42	30.5
"	Fullerton Av. Station.	⁸ tubular 375	Tinkham.	ordinary.	Pittsburgh. medium.	42	30.5
"	N. W. Parlor Suit Co.	² tubular 150	Batman.	indiff.	refuse and nut coal. light.	42	30.5
"	Corper & Nockin.	² tubular 150	none.	indiff.	nut coal. black.	42	30.5
"	Phoenix Distillery.	¹⁰ tubular 1200	Murphy furnace.	automatic.	slack. very light.	42	30.5
"	Geo. A. Weiss Malt H.	² tubular 120	none.	indiff.	Ind. block. black.	42	30.5
"	F. H. Stephens.	¹ tubular 50	none.	careless.	Ind. block. very black.	42	30.5
33	W. S. County Hospital.	⁸ tubular 600	Hutchinson.	indiff.	Ind. block. black.	42	30
"	Rush Medical College.	³ tubular 120	none.	ordinary.	Ind. block. medium.	42	30
"	Chicago Hospital for Women.	² tubular 150	none.	indiff.	Ind. block. black.	42	30
"	Franke & Sievers.	¹ tubular 50	none.	careless.	shavings & nut coal. black.	42	30

SMOKE OBSERVATIONS, 1889.—Continued.

DATE.	NAME.	HOLLERS, HORSE POWER.	DEVICE IN USE.	MODE OF FIRING.	COAL USED.	CONDITION OF SMOKE.	THERMO- METER.	BARO- METER.	REMARKS.
23	Wisconsin Elevator.	2 tubular 150	none.	careless.	Pittsburgh.	black.	42	30	
"	Hoerber Brewing Co.	2 tubular 150	none.	indiff.	Pittsburgh.	black.	42	30	
"	W. Side Water Works.	12 tubular 240	brick arches.	crowded.	Pittsburgh.	black.	52	30	
"	J. S. Gougar & Co.	2 tubular 120	none.	careless.	shavings & nut coal.	black.	42	30	
"	Hair & Ridgeway.	250 tubular	Butman.	careful.	shavings & nut coal.	medium.	42	30	
"	Stephens Bros. & Co.	3 tubular 150	none.	crowded.	shavings.	black.	42	30	
"	T. Wilce & Co.	3 tubular 120	none.	crowded.	shavings.	black.	42	30	
"	T. Goodwillie & Co.	1 tubular 150	none.	crowded.	shavings.	very black.	42	30	
"	T. C. Diener.	1 tubular 75	none.	careful.	nut coal.	medium.	42	30	
"	T. W. Harvey & Co.	2 tubular 150	none.	crowded.	shavings.	black.	42	30	
26	Crane Bros. Mfg. Co.	4 tubular 300	air blast.	ordinary.	hard coal screenings.	light.	48	29.5	
"	F. Krause & Co.	1 tubular 50	none.	careless.	nut coal.	very black.	48	29.5	
"	Chicago Screw Co.	2 tubular 120	Butman.	careful.	nut coal.	light.	48	28.5	

26	Beidler Building.	⁴ tubular 340	Kelley.	careful.	Ind. block.	light.	48	291.5
"	Frances Building.	² tubular 150	Farr.	indiff.	nut coal.	very light.	48	291.5
"	S. K. Martin.	² tubular 150	none.	crowded.	shavings.	black.	48	291.5
"	S. B. Barker & Co.	³ tubular 275	none.	careless.	shavings.	very black.	48	291.5
"	Garvyn & Jenkinson.	² tubular 150	none.	indiff.	nut coal.	black.	48	291.5
"	Rabbitt, Harty & Toley	² tubular 100	none.	careless.	shavings & nut coal.	very black.	48	291.5
"	Perren & Menzie.	² tubular 100	steam jets.	careful.	Ind. block.	light.	48	291.5

TOTAL NUMBER OF PLACES VISITED, 333 ; INCLUDING 839 BOILERS.

Since this report was put in type, the examiner has inspected the Dauford and Sagle Smoke Consumer at the North-Western Car Shops ; its operation is faultless in its application to the locomotive type of stationary boiler.



